Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (please print)

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ECE 2300 – Quiz #1

September 11, 2014

Keep this quiz closed and face up until you are told to begin.

1. This quiz is closed book, closed notes. You may use one 8.5” x 11” crib sheet, or its equivalent.

2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.

3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**

4. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.

5. Do not use red ink. Do not use red pencil.

6. You will have 30 minutes to work on this quiz.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/20

Room for extra work

Six components, labeled A, B, C, D, E, and F, are connected as shown in the circuit diagram given in Figure 1. Some voltages and currents are defined in the equations below. The currents in this circuit are made up of the flow of electrons.

1. Find the direction that the electrons are moving through component D at *t* = 1[ms]. Your answer should be either left to right, or right to left. Explain how you got your answer.
2. Find the power delivered by component C at *t* = 2[ms].
3. Find the energy absorbed by component B during the time period from
*t* = 1[ms] to *t* = 4[ms].
4. Find the energy delivered by component B during the third [millisecond], counting [milliseconds] starting at *t* = 2[ms].





Room for extra work

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2. Find the power delivered by component C at *t* = 2[ms].
3. Find the energy delivered by component B during the third [millisecond] after *t* = 2[ms].

*vX(t)* = 5.3[kV/s]*t* + 3.5[V]

*vQ(t)* = 6.4[kV/s]*t* – 4.6[V]

*iX(t)* = -7.5[kA/s]*t* – 5.7[A]

*iQ(t)* = -8.6[kA/s]*t* + 6.8[A]



Room for extra work

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ECE 2300 – Quiz #1

September 11, 2014

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/20

Room for extra work

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2. Find the power delivered by component C at *t* = 2[ms].
3. Find the energy delivered by component B during the third [millisecond] after *t* = 2[ms].

*vX(t)* = 3.5[kV/s]*t* + 5.3[V]

*vQ(t)* = 4.6[kV/s]*t* – 6.4[V]

*iX(t)* = -5.7[kA/s]*t* – 7.5[A]

*iQ(t)* = -6.8[kA/s]*t* + 8.6[A]



Room for extra work

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Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ECE 2300 – Quiz #1

September 11, 2013

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4. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.

5. Do not use red ink. Do not use red pencil.

6. You will have 30 minutes to work on this quiz. D

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/20

Room for extra work

Six components, labeled A, B, C, D, E, and F, are connected as shown in the circuit diagram given in Figure 1. Some voltages and currents are defined in the equations below. The currents in this circuit are made up of the flow of electrons.

1. Find the direction that the electrons are moving through component D at *t* = 1[ms]. Your answer should be either left to right, or right to left. Explain how you got your answer.
2. Find the power delivered by component C at *t* = 2[ms].
3. Find the energy delivered by component B during the third [millisecond] after *t* = 2[ms].

*vX(t)* = 5.3[kV/s]*t* + 3.5[V]

*vQ(t)* = 6.4[kV/s]*t* – 4.6[V]

*iX(t)* = -7.5[kA/s]*t* – 5.7[A]

*iQ(t)* = -8.6[kA/s]*t* + 6.8[A]



Room for extra work

ECE 2300 -- Quiz #1 – September 11, 2014 – Solution Version 1. Only the solution for this version is shown. We will assume that you can determine the solution for other versions from this.

Six components, labeled A, B, C, D, E, and F, are connected as shown in the circuit diagram given in Figure 1. Some voltages and currents are defined in the equations below. The currents in this circuit are made up of the flow of electrons.

1. Find the direction that the electrons are moving through component D at *t* = 1[ms]. Your answer should be either left to right, or right to left. Explain how you got your answer.
2. Find the power delivered by component C at *t* = 2[ms].
3. Find the energy absorbed by component B during the time period from
*t* = 1[ms] to *t* = 4[ms].
4. Find the energy delivered by component B during the third [millisecond], counting [milliseconds] starting at *t* = 2[ms].





Solution:

1. We note that the current through component D is *iQ.* So, we can find *iQ* at *t* = 1[ms] as
*iQ(*1[ms]*)* = -6.8[kA/s]1[ms] + 8.6[A] = 1.8[A].
Looking at this solution, we can see that *iQ* is positive, so the current is flowing right to left. Since the charge carriers are electrons, which have a negative charge, the electrons are flowing left to right.
2. For component C, we know that since *vX* and *iX* are in the passive sign convention for component C, that
*pDEL.BY.C = -vX iX.*Plugging in the values at *t* = 2[ms], we get
*pDEL.BY.C = -*{3.5[kV/s]2[ms] + 5.3[V]} {-5.7[kA/s]2[ms] – 7.5[A]} =
-{12.3[V]} {-18.9[A]}
*pDEL.BY.C =* 232.47[W]
3. We can see that because *vQ* and *iQ* are in the active sign convention for component B,
*pDEL.BY.B = vQ iQ.*So, to get the energy, we integrate of the time period from 4[ms] to 5[ms], which would be the third [millisecond] after *t* = 2[ms].
Then, we integrate the product of *vQ* and *iQ*, from 4[ms] to 5[ms], to get our solution, using our calculator to integrate, which is
*wDEL.BY.B*
*wDEL.BY.B =* -317.2[mJ].